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Procuring for productivity

‘Transforming procurement
to become the enabler’

#CE nuclear productivity series
volume 4





Foreword

By Chair of Nuclear Focus Group

I am pleased to see the release of our fourth and final volume in this productivity series. It builds on the arguments and ideas that we set out in Volume 1 – factory thinking. It is perhaps the one that with a strong client drive and application of the ideas explored within will have most impact in gaining highly productive supply chains. This can be enhanced further with the application of the material provided in other volumes.

Most procurements in the nuclear industry engage large, complex and varied supply chains. This is through a mixture of models and is subjected to tough regulatory oversight. They are often deep, include bespoke and commodity goods and services and the engagement of international organisations. Most nuclear projects have hundreds of organisations engaged in many ways suggesting that there is no single answer to gaining productivity. But it does need to be prioritised, recognised and addressed. The question of what productivity is and how it is measured is addressed in volume 1. This highlights factors that impact productivity both negatively and positively. It identifies client leadership, collaborative structures and contracts. All key areas of procurement that play a substantive part in driving productivity.

This volume explores all these aspects and why **productivity should be at the forefront of procurement thinking**. It suggests approaches and arrangements that need be crafted through strategies, processes ultimately expressed in legal documents. This thinking should drive to secure the most appropriate supply chain as efficiently as possible. This will provide most economically, the appropriate skills, capabilities and capacities and consider productivity considered holistically within the client, within the supply chain and across the multiple interfaces.

Therefore, by offering new ways of thinking in procurement strategy, models and mechanisms, many of which are proven in other industries that seem entirely applicable to our nuclear industry, we can then start to close the productivity gap. The key always is gaining the high levels of collaborative working that is a key concept promoted by Constructing Excellence.

I am very grateful to all those that have contributed to this volume. The sheer caliber and stature of you all have is impressive and therefore bares significant weight to this volume's content. I especially thank Adam Newbould for his leadership and endeavour.

I encourage your serious consideration of its content, as productivity must be addressed to ensure we have a sustainable nuclear industry. As I have said before, please get on board with this thinking. Question and challenge what is being done to develop productive supply chains. It is just not a procurement professional issue either but stretches across many disciplines. All need to align and the burning platform is real.

Adrian J Worker
Jacobs UK



By volume 4 lead author

With more than 25 years experience in the business of procuring things, it occurs to me that the whole process has gradually become more complicated. It's like we have created an industry for ourselves that has almost become a black art. And it seems that the balance of power has swung from obtaining value, to trying to protect procurers' organisations from challenge, most of the time with little positive effect.

My early career started in the manufacturing industry, where the key principle was to keep the production line running. Yes, we needed to get good prices for components to preserve our margins, but satisfying customer demand was the key objective. Procurement was dynamic and exciting. It was like the trading floor at the stock exchange. And when a major fire at a silicon chip factory in Japan struck, we became the heroes who kept the plant running by sourcing alternative products all over the world. Sometimes by courier delivery via plane, motorbike and through customs to meet a shipment due out the same day! How I loved that environment, and how much we were the "enabler" in the whole process.

Sadly nowadays, if you took a survey of manufacturing/construction directors, I think you would have a very different perspective. Someone seems to have created a monster that has morphed into something unrecognisable and it has turned on its master, who now seems helpless to control it. The procurement process, particularly in the public sector is way too complex, to the extent that evaluators of tenders consistently fail in the proper application of evaluation criteria, which invariably ends up in a challenge by the supply chain due to lack of transparency.

My predominant objective right from the start of receiving this commission from the Chair of the Constructing Excellence Nuclear Focus Group, was to make it fully inclusive of every part of the supply chain. My volunteered "champions" have been scribing away for many weeks now in putting this document together. I am really keen to emphasise that it is very much their document, a collective view and not just mine. My huge thanks therefore go to them, in bringing this volume 4 of the Construction Factory Thinking series together. And to those who contributed their time at the initial workshop and those who facilitated throughout.

In reality though, their hard work has only just begun. Their remit as champions is to promulgate and disseminate the theory we have collectively developed and to put it into practice, within their span of control. And when this has commenced, they need to become "disciples" for procuring for productivity and value, instead of just for price.

This is the start of a brave new world my procurement friends and now is our opportunity to take front and centre in helping our organisations, the supply chain and the end users of the infrastructure we help to create be more efficient, innovative and above all productive.

Adam Newbould
RTFC Consulting Ltd



Introduction

The perception of procurement needs to change, from its current position of being seen as a barrier to progress and to become the “enabler” of productivity. The construction industry, as compared to other sectors, has flat lined in terms of productivity. One of the reasons for this is that the approach to procurement has not evolved to address the current landscape of the industry, with major clients now increasingly reliant on the expertise of external contractors to deliver complex outcomes.

It is not sufficient to just simply implement improvement initiatives within client organisations. The network of organisations that are required to come together to deliver an infrastructure project need to be coordinated and managed effectively. Therefore, the role of procurement needs to move beyond getting the contracts in place, to managing boundary-spanning enterprise-wide activities. Developing suppliers’ capabilities by implementing training and continuous improvement programmes, forming collaborative relationships not only with its own supplier network, but also between all of the suppliers in the construction sector supply chain.

It should be acknowledged that procurement, or acquisition, as it is sometimes referred to, has come a long way in recent years. However, there is still far to go and still much to do. Building on the good work done by Project 13, The Institute of Civil Engineers and the Infrastructure Projects Authority. It is acknowledged that a radical change to the way we go about procuring or acquiring the goods and services required to achieve productive outcomes, is undeniable. In this paper we examine the key issues that need to be addressed to allow this to happen.

A pan-sector workshop was held at the end of January 2019, where representatives from client organisations, major construction contractors, procurement experts, legal advisors and academics were invited to participate in a brainstorming session to collectively identify ways to make the whole procurement cycle more efficient, easier and quicker to navigate both for the supply chain and for major clients.

Specifically, the objectives of the of this exercise and ultimately this paper, are to address the four main deficiencies that are a recurring theme of current procurement practice:

- The complexity of the process (particularly in public contracts)
- Failures in proper application of evaluation criteria
- Too much emphasis on cost, over value
- The amount of time/resources/money spent on PQQ & ITT returns

The following seven chapters of the paper were identified as the key factors that need to be addressed if we, as procurement professionals are to bring about positive and radical change to a construction industry that is currently in a state of disrepair and could soon be broken altogether.

If this paper resonates with you and you are interested in better understanding of the principle of procuring for productivity and you would like to get more involved and support development of initiatives that will have a positive impact on the industry, please get in touch at:

helpdesk@constructingexcellence.org.uk

And join the **#CENuclear** group



1. The need for radical change

Nuclear sector deal

Our sector deal¹ states that the procurement systems and methods in the industry can result in overly prescriptive practices. This can result in the same product being supplied to different industries, but with the nuclear product attracting a much higher degree of specification and therefore price. The method of procurement and specifications can be so different that it is hard to understand for new entrants, and existing suppliers, which again results in increase of cost. The result is the UK supply chain becomes more expensive than necessary and less competitive on the open market, new entrants are deterred and innovation stifled.

An opportunity therefore exists to reduce costs, save programme time and increase labour productivity through a more fit-for-purpose approach to procurement and implementation of more standardised systems. To seize this opportunity, clients will need to improve procurement practices by:

- Specifying more appropriate component requirements (i.e. according to need, rather than driving up costs through over specification)
- Procuring based on outcomes rather than detailed component specifications – thus encouraging innovative solutions
- Encouraging tenderers to outline the full lifecycle costs of products or services, thus ensuring that all costs (including through-life costs such as maintenance) are taken into account when making procurement decisions
- Using data management systems, for example establishing a common data platform through Building Information Modelling (BIM) so that construction, asset and design information can be more efficiently shared across the supply chain

This approach has generated benefits for publicly procured construction works, as highlighted in the Government's construction strategy², and there is considerable scope to adopt these digital techniques in the nuclear industry to reduce the risk of error and project delays particularly given the large-scale nature of many nuclear projects, which often require significant financing and thus delays can result in substantial interest costs.

1. <https://www.gov.uk/government/publications/nuclear-sector-deal/nuclear-sector-deal>

2. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/510354/Government_Construction_Strategy_2016-20.pdf

3. <http://www.p13.org.uk/>

4. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/529311/handbook_2016.pdf

Simplifying procurement in the nuclear industry

The supply chain spends an inordinate amount of effort responding to over complex PQQ & ITT, the cost of which then needs to be recovered during the job. This seems somewhat not good value for money. Project 13³ and its commercial guidance, the IPA six pillars⁴ and ICE procurement advice is, most definitely, taking us in the right direction of more robust procurement practice. But in they still haven't got us where we need to be.

Recognising why design is critical to productivity

At the recent Constructing Excellence seminar, it was apparent that several construction sector clients are utilising an alternative strategy to traditional methods of construction. We will discuss organisational integration in section 5 later in this volume. But it is vital that design team and procurement work collaboratively together at the earliest stage of project inception. If clients design for productivity this will enable to procurement procure for productivity also.

Component-led design

Design for Manufacture and Assembly (DfMA) could bring a step change in efficiency and waste reduction. DfMA uses BIM technology to design assets and components that are manufactured in factory conditions and transported to site for safe assembly. The industrial nature of DfMA brings production line efficiencies to construction, reducing waste not only in raw materials, but in human resources, time, cost and carbon too.

Standardisation

Offsite construction using standardised factory-made components has the potential to reduce the current risks to future infrastructure delivery. As seen in the housing sector it offers shorter programmes and reduced costs coupled with higher outputs and more consistent quality. The reduction of head-count on site also improves health and safety.

To realise the benefits of offsite for infrastructure, a compromise is needed from what might traditionally have been considered an "optimised design". Small concessions made in designing bridges to standard skews, or to modules of fixed span length, will most likely be offset by productivity benefits. It would allow the use of standardised components (including multiple-use of expensive precast moulds), that lend themselves to automated digital engineering, manufacturing and traceability.



Architects must be incentivised to design for productivity

The appointed architect must be brought into a Target Value Design (TVD) Alliance at earliest possible stage. Productivity is simply not an issue to those managing and operating sites. More attention must be given to constructability and buildability. With great effort the labour content of alternative designs might be estimated using work study generated synthetic data rather than estimators' rates. A new role of the architectural technologist should be developed to include a work study synthesis and evaluation of time and manpower content of alternative designs. It is only by making a detailed analysis of the likely effects on production that the "buildability" of alternative designs might be appraised.

Such evaluation may well be part of the role of a new specialist, the "construction architect" who extends the current role of the architectural technologist when developing concept sketches into working drawings. It will probably be necessary for these specialists to undertake site activity sampling studies to fully evaluate the effects of changes made to enhance buildability, and for systematic production development to become a recognized part of the design service offered by architectural practices to clients. Alternatively, the adoption of constructability principles and a trend towards American style management contracting, will improve buildability for design with production in mind must be increased if specialist trade contractors are undertaking detailed design. These specialist trade designers will need to have an awareness of work study techniques for productivity improvement if their firms are to prosper in the long term.

Data-driven decision making

Data in information technology sector is fundamental to informed decisions expediently. There is absolutely no reason why this shouldn't be the case for the construction sector. Data can help everyone get ahead. It's one of the organisations most valuable assets, keeping track of the weather, aiding with collaboration, managing disputes, and assisting with other management responsibilities. Data ensures that every stage of a project goes as it should, from design to the final touches. Strategic implementation of data management will help to make informed decisions and get an idea of the best way to propel your project forward.

Establish robust baseline data

Consistent, effective benchmarking should help underpin decisions on project selection and delivery. It can play an important role across the project lifecycle but is most needed at the start of the process, where ill-informed choices can derail a project's chance of success. There is unavoidable uncertainty on cost, schedule and expected outcomes at this early stage, where project scope is still being defined and multiple options being considered. Benchmarking will help to provide an additional level of informed challenge and assurance during this critical phase, leveraging data and experience from previous projects.

Target value derived from top-down and bottom-up benchmarking and not from tendering

A capable client must know what budget they have to spend. As Andy Mitchell of Thames Tideway recently said, "we don't buy a house, or a car, or choose a holiday based purely on lowest cost. It's a combination of many things; primarily it is based on the budget we have. So why should this be different when we are acquiring major projects?"

2. Route to market

The route to market is the last stage of the procurement process before contract award, often referred to as the transactional stage; it is characterised by the methodology of down-selection and the trade-off between competitive leverage, competitive advantage and degree of development of requirements and methodology during the process.

Where we are currently

As we have said earlier, for many years procurement has been seen as the “blocker” in most organisations or major infrastructure projects. We always hear that the procurement process is clunky, it takes too much time and it’s not fit for purpose in what we are trying to achieve. But nobody is focusing on the steps that companies/clients need to take before you even get to talk about the procurement route/strategy. The procurement route is usually driven by the business requirements such as: business case, budget, cost savings, programme, risk, etc. Often procurement is asked to get involved almost right at the last moment, when there is no time to influence the route to market, or to come up with a bespoke one that will achieve the best outcome.

The mindset in the construction industry is very much a “blame mindset” and the main things contractors/designers/consider are:

- How can we get services for free
- Value engineering after the contract is being awarded
- How can we hide costs to increase our profit
- Compensation events/change and claims
- How to push risk on the other party without increasing costs

Usually clients spend more time after the contract award to integrate the teams and to implement the processes/procedures that they need to follow to deliver a successful project. When setting up or starting a project all the parties (contractor, designer, procurement, contracts, internal stakeholder(s)) need to be involved from developing the business case all the way through to contract implementation and management. The contract needs to focus on collaboration and ways of working that will encourage an open and honest relationship between all the parties involved to encourage and embed productivity throughout the lifecycle of the project.

The industry needs to change. Contractors, designers and clients need to come together right at the start of when business case and contracting strategy are being established to appoint the best party to manage the risks. Procurement is a dynamic process that sources the best value solution to a requirement through the sustainable allocation of risk between a client organisation and its supply chain network. Procurement exists to explore the market opportunities and to implement strategies that deliver the best possible outcome, in terms of value and productivity to the organisation, its stakeholders and its customers.

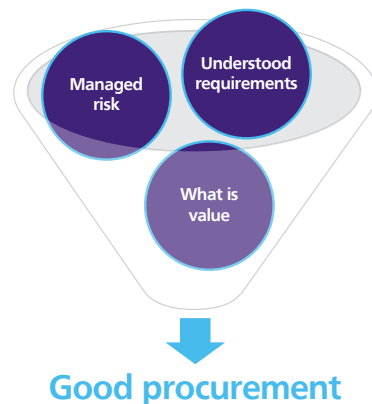




What should good procurement look like?

Good procurement optimises both the delivery of requirements and the clear articulation and allocation of risk for the client and the supply chain. To engage in good procurement, the client needs to know:

- What the requirements of the project are and the outcomes and benefits expected
- The market appetite capability and capacity to provide the services required and engage in a longer term strategic relationship
- Which risks are best managed in-house, based on the organisation's risk appetite, and which risks are best placed with and managed by the supply chain
- The key business drivers for the suppliers, both reputational and remunerative, within the various markets that will deliver the requirements
- How procurement will support the proposed target operating fosters and supports strategic ongoing or early engagement to encourage market capability development
- That the outcomes are based on shared drivers. This will enable the client and the supply chain to work towards better alignment and thus engender a truly collaborative relationship
- That the procurement strategy adopts and complies with a clear and transparent process and it recognises that there is always likely to be shared reputational benefits, risk and reward and that it supports the overall execution strategy and client model



Preliminary market consultation

When needs/outcomes have been clearly defined, procurement should screen the market for solutions that are already available or under development. They may find that suitable innovative solutions already exist, or that they could be easily created by adapting or combining the existing ones, or that the market may be able to develop an innovative solution in a satisfactorily short time – it only needs to be given the opportunity to do so. The main purpose of the preliminary market consultation is thus, essentially, checking the state of the art.

The preliminary market consultation can take various forms. The main requirement is to perform in a transparent and non-discriminatory way, without privileging one solution, technology or process over others. It can be complemented by presentation and testing of samples by the end-users to give them an opportunity to verify the proposed solutions under real-life conditions. With appropriate market consultation procurement will gain the necessary knowledge of the existing solutions, parameters, properties and measurable indicators to help them in drafting the final technical specification. Only technical specifications informed by an understanding of the state of the art will allow the most efficient and innovative solutions to compete and provide the public procurer with the best added value through uptake of existing innovative solutions or by stimulating the development of even more innovative ones. Since innovative solutions inevitably entail uncertainty and possible detours, starting as early as possible is the key.

Innovation in tenders

Even public procurement organisations can allow tenders to be submitted with “variants”. This means that a tender can include a main offer which closely matches the technical specifications, accompanied by one or more alternative solutions, usually based on alternative technologies or processes that could further encourage the creation of an optimised, highly productive project and organisation. This allows the suppliers to offer, together with a traditional and compliant solution, a more innovative solution that may attract attention of all stakeholders, in terms of increased efficiency in terms of cost, quality and flexibility. Procurement may even choose to allow the submission of variants only. This option may facilitate the participation of start-ups and innovative SMEs that may be able to provide only one form of innovative solution. The use of variants is therefore one of the simplest and most secure ways to stimulate innovation uptake in public procurement. It is simple in the sense that the public



procurer needs only to authorise the use of variants and it is secure in the sense that if the more innovative variants do not work, an economic operator still has a fair chance to win the contract with the more conservative tender.

It goes without saying that the use of variants is most efficient when combined with functional requirements and appropriately set award criteria that enable various solutions to be compared in terms of their performance, efficiency, cost effectiveness, versatility or durability. Without enabling these parameters for comparison it will be difficult to compare the respective advantages of variants.

Options to be considered

The ultimate determination of the selected route to market is the final part of the jigsaw in the development of the procurement strategy prior to the transactional process beginning. Procurement should be aware that while there are only a limited number of routes to market, it is likely that a major programme will use all of them in some shape or form.

3. Contracting models

The use of Super ECI pre-contract

It's a folly to think that in complex construction projects, the risk is shared equally by all parties. The reality is that irrespective of where the risk is tilted towards in the contract, the risk should ultimately be owned by the client. If for any reason a project goes over budget, is delayed, or is a failure, it is the client that ultimately bears the risk of financial and reputational damage, while the tier-1 contractors could arguably move on to other projects. Unsurprisingly, therefore, the number of disputes in the UK construction industry has increased. Thus, a new approach to the governance of these transactions and client-contractor relationships is needed. One way to do this could be to get the tier-1 contracts to have skin in the game through a possibility of tier-1 equity in project outcomes. An examination of the appetite and mechanisms to achieve this, however, needs to be conducted.

For the UK to be competitive, it needs high performing infrastructure. Not just built efficiently and with high productivity but having highly effective solutions leading to infrastructure and facilities that are easy to operate, resilient, maintainable, productive and that operate at optimum outputs. Furthermore, advances in technology and the advent of the Industrial Revolution 4.0 open a myriad of opportunities for transformational change in the way we procure, build, operate, maintain and improve. To deliver the need and leverage this opportunity requires appropriate procurement strategies to be developed. This report focuses on complex project and programme methodology where current best practice indicates that collaborative styles are central to the most effective contracting models.

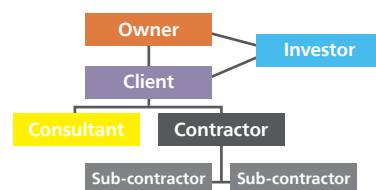
Recognition in the early 80's that transactional procurement on complex schemes was sub-optimal was really the start of the growth of collaboration as a principle. We saw much more design and build which brought collaboration between designer and contractor for constructability of design. Later we moved to forms of Early Contractor

Involvement (ECI). The client, usually the owner and operator, thus utilised the expertise of the supply chain in collaboration to transform the options and solutions phases of procurement for better outcomes. A two-stage procurement would be typical with a professional services type ECI contract followed by a construction contract with negotiated scope based on open-book estimates plus a pre-tendered fee and supported by a clear allocation of risk ownership and contingency provisions.

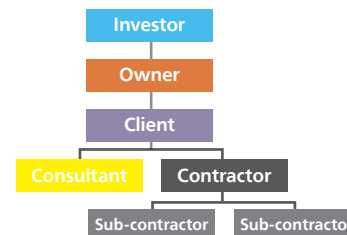
The NEC4 Alliance Contract (ALC)⁵ marks the next step in collaboration, creating a "true" alliance arrangement in which the client and all key members of the supply chain, called "partners" in the ALC, are engaged under a single contract. All members of the alliance have an equal voice and share in the performance of the alliance as whole as opposed to their own individual performance. Additionally, NEC4 now has an entire option within its framework dedicated to BIM. Option X10 contains guidance on ownership of the model and it identifies liability in the event of a fault. It also refers to the timescales and process for implementation and acceptance of the "Execution Plan". NEC4 refers to BIM as "Information Modelling", along with a number of other adjustments to accepted terms. This support for BIM terminology is something other contracts have failed to achieve.

These new forms of procurement were in early years only for the brave as a "leap of faith" was often required on risk, uncertainty and real collaborative behaviours. However, history tells us that a shared and negotiated approach to risk/opportunity ownership and mitigation/realisation often resulted in much better outcomes. In the last decade, some clients have taken collaboration to the next level. Colloquially here referred to as Super ECI, this is where the client has entered into long-term relationships, often termed "frameworks" where the supply chain collaborates much more widely within the client's business. Sometimes this goes as far as incentivised sharing in business plan linked rewards and penalties and drives common behaviours in achieving required procurement outcomes.

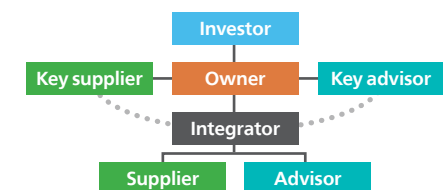
Transactional Structure (Public Sector)



Transactional Structure (Private)



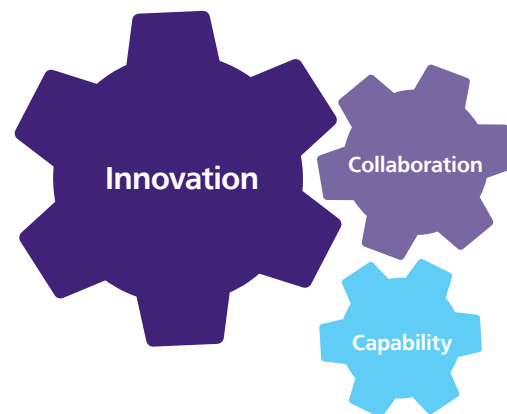
Project 13 Enterprise Structure



5. <https://www.neccontract.com/NEC4-Products/NEC4-Contracts/NEC4-Alliance-Contract>

As pioneers of change we can observe the procurement process in the water sector over the last 15 years. The sector like most regulated industries faced ever increasing pressures to improve whilst maintaining customer bills “affordable” at effective historic levels and at the same time providing returns to investors. To change was a necessity, not an option, but instead a “burning platform”. The approach taken was like a “Super ECI” with collaboration moving deeper within the clients own business solving complex problems to demanding targets for “more for less” and later “much more for much less”. This has delivered impressive results in many cases. For example, Severn Trent Water has achieved programme savings of up to 28% on like-for-like outcomes in its previous 5 year regulated period. Analysis of collaborative framework regulatory, innovation, safety and efficiency performance of the water and wastewater companies in regulatory AMPs 5 and 6 suggests the most successful models adopt an integrated, inclusive approach:

- **Capability** – defining accountabilities at different programme phases from business plan pricing to operations depends upon the relative capabilities of all parties
- **Collaboration** – end-to-end collaboration delivers good outcomes and an aligned and efficient process
- **Innovation** – the most successful teams have a strong culture including incentives for innovation and continuous improvement
- **Longevity** – successful teams transformed and increased performance with maturity of relationship
- **Lean Principles** – fewer “hard” handovers drives out waste



Innovative new forms of contract

For a significant number of years now the construction industry in other advanced countries have been employing shared-risk, multi-party contracts to drive the successful creation of numerous large capital infrastructure projects. For complex projects such as these, multi-party contracts are essential in creating a reliable delivery model where the goal is to equally bind together project team members – including architects, design engineers, trade contractors, and specialty consultants – to the owner’s definition of what constitutes ultimate project success.

Having a shared-risk contract, between the right mix of owners, designers and builders from the start of design, aligns the financial interests of the participants with the goals of the owner. This shared financial interest creates a focus on risk and uncertainty that drives out all our historic behaviours that create that risk and uncertainty and opens everyone up to inviting in behaviours that drive that risk and uncertainty out. In terms this drives the success of the project.

Lean Integrated Project Delivery contracts

Integrated Project Delivery (IPD) is a project delivery method distinguished by a contractual agreement between a minimum of the owner, design professional, and builder where risk and reward are shared and stakeholder success is dependent on project success. IPD should be understood as a comprehensive process which addresses the entire sequence of programming, design, construction and building operations. Within the industry, there is a fair amount of confusion about the difference between lean construction and IPD and between IPD and BIM. Lean construction is a production control system that seeks to apply principles of the “Toyota Way” of manufacturing to the construction process. Just as BIM is a tool that is useful, but not in itself sufficient for implementing IPD, lean construction is a set of tools in support of IPD but is not the entire process.



Multi-party contracts

The Integrated Project Delivery Agreement (IPDA) is a three-way contract between the owner, the architect and the builder. Each party's success is directly tied to the performance of the others. Distinct roles and responsibilities are delineated in contract language and in a "responsibility matrix." Major subcontractors (mechanical/fire protection, electrical, and drywall) were also brought in to the agreement, worked at cost, and shared in the incentive program. The IFOA is a three-way contract between the owner, the architect and the builder. Each party is held accountable to each other as equal partners. Architect and builder combine their contingencies and are jointly responsible for construction errors and design omissions. All books in regard to the project are open. This contract was the first of its kind to be used by any of the parties and may have been the first such agreement to be used on a construction project in the USA.

Shared risk/reward

The contract establishes an Incentive Compensation Layer (ICL) in which the architects' and builders' anticipated profit is put at risk. If specific goals are met, designers and builders receive their normal profit, but jointly, not separately. If they are exceeded in measurable ways the firms are eligible for additional compensation. The ICL could adjust from minus 20% to plus 20% depending on whether project goals were met or exceeded. The Integrated Form of Agreement (IFOA - a "relational" contract) creates a system of shared risk with the goal of reducing overall project risk rather than shifting it between parties. Contingency funds are jointly managed by the project participants rather than at the owner's discretion alone. The early version of IFOA used for this project allowed for a financial incentive plan but the participants elected not to implement it. "It was all so new," said Bonnie Walker of HGA, "We were still in the mindset of business as usual." Subsequent Sutter IPD projects have used incentives funded by project savings and pooled profits to reward designers and builders for meeting and exceeding agreed project goals. In these projects most sub-consultants and subcontractors participate in the pool as well.



Liability waivers among key participants

The parties waived all claims against each other except those arising from fraud, wilful misconduct or gross negligence. Disputes were to be resolved by mediation or, if necessary, arbitration. Each party was required to maintain typical insurance but with the provision that policies be amended so that no right of subrogation (the ability to gain the rights belonging to one party against a third party who caused a loss) existed against the other partners.

Jointly developed/validated targets

The contract spelled out specific criteria that would be used to judge success. These included schedule and budget, sustainability, quality of craftsmanship, functionality, and design quality. Owner, architect, and builder jointly selected three comparable projects in the Boston area to serve as benchmarks against which these goals would be measured. It was agreed – after some hesitation from the team – that an independent evaluator (in this case an architecture professor) would be the arbiter of how successfully the project met the design quality criteria. There was a scorecard and the process were made as objective as possible.





4. Supporting the project delivery

Understanding value

For a project to be successful, it must achieve the value proposition identified in the initial business case. Whether this in terms of affordability, quality or programme milestones, and the project value and how it will be tracked during project definition, development, implementation and operation must be an integral part of the business plan. Poor scope definition leads to uncertainty, arguably the most significant impact to the delivery of the project business case. Increasing scope certainty, understanding risks, collaborating with the supply chain and establishing a realistic programme are key to achieving productivity and project value.

Value needs to be identified in the business case, and tracked through project development and into procurement to ensure benefits will be realised and the initial value supporting the business case is achieved. Project process, behaviours and delivery must be focused on delivering the project value and must be fully incorporated into the procurement process. An improvement in productivity is a key element that can drive value into project performance.

How poor procurement impacts project delivery

The UK construction industry has a challenging history of achieving project benefits to budget and programme due to the nature of bespoke and complex works undertaken. Previous studies undertaken, support a “manufacturing” based approach to construction through Lean and other techniques have taken the industry forward. But, due to the nature of the work, every project will experience some form of change during construction. This could be due to government pressures to commence work during a particular parliamentary term, treasury funding constraints, physical conditions, or the maturity of design and requirements.

Typical issues can include:

- Poorly defined project scope
- Inadequate project planning
- Lack of managing key interfaces
- Political / stakeholder influence

- Numerous legal amendments to standard contracts
- Supplier / sub-contractor prices exceeding budgets
- Traditional contracting behaviours

Projects by their very nature are complex; a decision to proceed through each stage of development needs to be taken based on risk and uncertainty. Cost planning, benefits realisation techniques, risk management and stage gate based governance all support the decision making process, balancing investment required during the development stages with the maturity of the design and requirements to achieve optimal value.

Legacy learning

Current major project procurement best practice is set out in IPA project initiation routemap, based on the 6 pillars approach used for the 2012 Olympics and Crossrail. This focuses on clearly defining requirements over the project lifecycle, engaging with the supply chain, then developing the procurement model and packages to achieve an effective route to market to achieve project objectives. Other recognised best practice includes the innovative contractor engagement model developed with TfL for the Bank station capacity upgrade⁶. Again, this best practice emphasises the importance of defining the project value, translating value into requirements, refining requirements through supply chain involvement and then procuring to deliver value.

Whilst this best practice is applied to well established industries such as rail, highways, etc., the lack of comprehensive data on costs and programme for major bespoke projects such as new nuclear under the UK context is a challenge. For example, the new nuclear developments in the UK have a good understanding of equipment pricing, but the construction in the UK regulatory context places a significant uncertainty on implementation.

With the lack of UK context experience in the supply chain, additional investment is therefore required in the development and testing of requirements under current procurement best practice to reduce uncertainty.

The business case for new power stations is heavily influenced by the efficiency and reliability of the technology, maintenance costs and generation hours. So if the value proposition for a new power station is driven by OpEx rather than CapEX, traditional procurement methods will not deliver this value. Through considering TotEX

6. <https://www.secbe.org.uk/content/panels/Report%20-%20Innovative%20Contractor%20Engagement%20Procurement%20Model%20-%20Bank%20Station%20Capacity%20Upgrade-6d5f2a.pdf>



the potential to develop a more productive operational product greatly increases. Understanding and delivering requirements as identified in current best practice is key to achieving generation revenue as early as practically possible to meet the project finance model and satisfy investors.

The application of lean construction techniques and digital modelling present opportunities to undertake this further refinement, to develop a “virtual build” led by the supply chain to deliver project benefits.

Integrating requirements with digital modelling

The challenge to all UK nuclear projects is achieving scope and programme certainty during the early stages of project development to provide confidence to potential investors that the baseline estimate is sufficiently robust and mature to determine affordability. This can only be achieved through undertaking detailed benchmarking against other projects, or adopting a manufacturing / lean construction approach to build, interrogate and refine.

Embracing digital technology is key to drive value, productivity and affordability for large bespoke nuclear and infrastructure projects. With such large sums invested before a financial investment decision, the initial development stage needs to maximise early contractor involvement to develop the outline digital model, plus test through input from operations teams to refine.

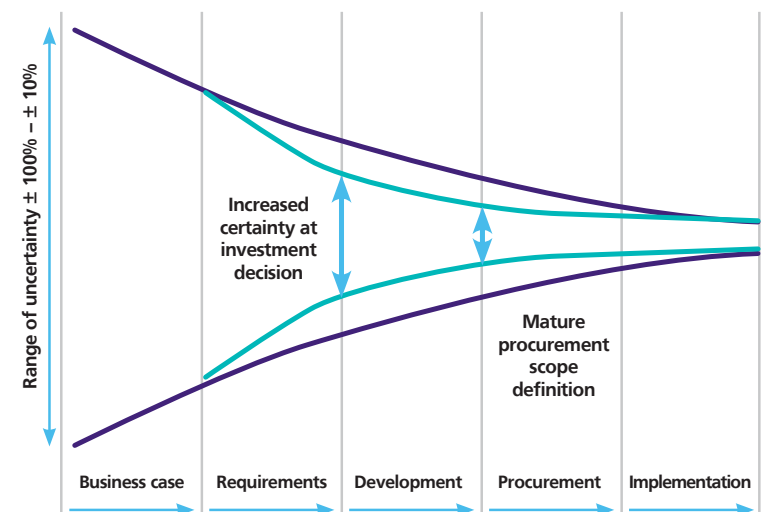
Once a financial investment decision is made, the key focus is to realise the business plan and in operational stations, commence generation as soon as practically possible. The traditional cost pressures on typical infrastructure projects suddenly become insignificant when compared with loss of generation revenue if the project is delayed. If a more productive methodology can be achieved due to productivity being a key selection/award criteria that then in turn allows generation to being early, this greatly increases the value of the procured solution. This is similar in decommissioning stations, where entering care and maintenance early can create large cost savings.

The procurement of work packages is based on a contract breakdown structure, optimised though the project development stages to identify critical nuclear equipment suppliers and other works such as civils, marine, M&E, logistics, etc. This is the basis for the procurement route whether under supply and install or construction packages to deliver the business benefits.

But, what if the procurement of work packages could be undertaken digitally, could suppliers access the digital model to study how their scope interacted with others, understand access and programme constraints, key interfaces. Current procurement best practice to encourage early supplier involvement in developing the project requirements whilst protecting their innovation must be adopted.

Through adopting a digital approach to project development and procurement, the cost certainty of projects could be significantly increased prior to the investment decision as seen below.

Project value uncertainty / risk



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Cost uncertainty (purple line) typically decreases with each stage project development as the scope and requirements mature through to completion. However, if a digital “virtual build” approach is adopted (blue line) similar to product development in the manufacturing industry, value uncertainty could be significantly reduced during the early stages of major project development. Digital techniques shift the balance of investment required in project development to attain greater maturity and certainty before a commitment or financial investment decision is made.



Digital “virtual build” also supports a fleet approach, recognised as the key to achieving affordability and achieving next of a kind and efficiency savings for the second, third and fourth development projects. EDF’s Hinkley C as a first of kind under the UK context captures key lessons learnt from other EPC reactor projects such as Flammanville, Okiluoto and Taishan to drive affordability. The business case for Sizewell C as recently announced by EDF during the Stage 3 Consultation is based on achieving next of a kind savings, targeted at 20% through replication of the design and supply chain for key contracts and a more productive construction process.

Digital modelling technology is available, which when used with lean construction techniques during early project development should be used to identify and minimise project waste, whether physical, programme or cost inefficiency. To truly adopt a lean construction approach, the project must be considered as a prototype, to be tested, refined, retested and further refined digitally before commencing any construction. The digital model must establish the project baseline to define the procurement strategy. It must be sufficiently robust to support clear requirements for tendering, but also offer opportunities for innovation, improvements in productivity and savings.

Cultural change

Suppliers are motivated to price major projects as competitive as possible and seek to rely on scope change / uncertainty to provide a return. The quality of procurement documents is often an issue supporting this behaviour, creating uncertainties and ambiguity that either needs to be considered as risk, or used to demonstrate change. This often creates challenging behaviours from the start of the project, as suppliers seek to claw back their financial position.

Current procurement practice and forms of contract are driven by cost, time and quality, which under UK regulation is the key requirement and one of the key risks to gaining certification to commence generation. Mechanisms can be included for performance incentives and in the case of alliance type arrangements such as the recently awarded Sellafield PPP which uses a profit pot arrangement to distribute gains to the alliance team, can drive completion.

The supply chain need to be incentivised to achieve this, not just through performance KPI’s but with buy in on the gains associated with early generation. This would focus the Tier 1 suppliers on collaboration due to the potential gains.

Civils and M&E installation contracts therefore need to include appropriate incentivising mechanisms to not only manage change in contracts, but to have a core team continually seeking programme improvements not only savings shared, but additional generation profit shared into a profit pot similar to the PPP arrangements used at Sellafield. Contractors can be procured based on traditional scope and contracts, but collaboration and joint incentives are key to maximising programme savings whilst achieving the quality required.

Just as clients such as EDF will have cost auditors looking backwards to interrogate suppliers costs, the same emphasis needs to be placed on critically reviewing the future to identify, investigate and validate potential programme savings without compromising quality. Just as a Formula 1 team will continually test and develop during the season, digital build techniques will support a culture on not just achieving benefits, but exceeding them. NEC compensation events should be seen as gain events, particularly focusing on programme acceleration without compromising quality. Only then though, the use of the digital model can change be managed effectively, to refine and optimise the design in parallel with construction, just as a manufacturer would refine their design without compromising delivery.



How to maximise value and productivity of procurement on project delivery

- Define the value proposition in the business plan
- Translate the value into a set of high level requirements
- Develop and refine the requirements through engaging with the supply chain to generate appetite
- Understand key interfaces and develop supply chain strategy based on categories and complexity of requirements
- Develop the outline 5D digital model aligning scope with cost, risk and programme to provide investor confidence
- Finalise the 5D digital model and requirements before financial investment decision
- Procure the requirements, using the 5D digital model as the basis for scope definition
- Launch tender packages using the digital model to support innovation, collaboration and better interface management
- Further develop the model, test and refine to finalise scope, manage uncertainties and understand dependencies through supplier involvement

What is the true value proposition? Cost, programme, or for a power station project should it be commencing generation? The business case for power is influenced by the efficiency and reliability of the technology, maintenance costs and generation hours. So if the value proposition for a new power station is driven by OpEx rather than CapEX, how do traditional procurement methods deliver this value? Current procurement practice and forms of contract are driven by cost, time and quality, which under UK regulation is the key requirement and one of the key risks to gaining certification to commence generation. Mechanisms can be included for performance incentives and in the case of alliance type arrangements such as the recently awarded Sellafield PPP which uses a profit pot arrangement to distribute gains to the alliance team, can drive completion. But, how often is OpEx considered during change. Digital will allow OpEx to be better understood.

Key enablers in supporting highly productive project delivery

- Procurement and project controls need to align the procurement plan and the contract breakdown structure, in order to manage key interfaces and a packaging strategy that is focused on programme, risk and buying power.
- Scope and programme must be well defined through digital modelling
- Tender packages should not be a list of specifications and drawings, but a set of requirements based around the digital model developed into a requirements management approach to delivery
- Contracts should be familiar with the supply chain, avoiding numerous legal amendments to confuse risk allocation and responsibility
- Operations teams must be involved during the early “virtual build” to test the project benefits
- Continual refinement during the project lifecycle to not only achieve but exceed benefit realisation

5. Organisational configuration

To address the productivity challenge facing the construction industry, there is a need to understand that complex infrastructure projects are not just bigger projects. Embedded in economic, political, and social contexts, combined with higher public visibility, they come with their unique form of complexity. From a procurement perspective, organisations of diverse resources and capabilities, size, and offerings need to come together and deliver at the right quality, cost, and time to deliver a complex infrastructure programme. Therefore, construction projects afford a unique set of challenges for the procurement profession.

The perception of procurement needs to be changed from being traditionally seen as a “barrier” to an enabler of productivity. One of the reasons behind this is that the approach to procurement has not evolved to address the current landscape of the industry. With clients now increasingly reliant on the expertise of outside contractors to deliver complex outcomes it is often difficult to embed continuous improvement initiatives within client organisations. The network of organisations that comes together to deliver an infrastructure project needs to be coordinated and managed effectively. Therefore, the role of procurement needs to move beyond getting the contracts in place to managing boundary-spanning activities, developing suppliers’ capabilities by implementing training and continuous improvement programmes, and being intentional in developing collaborative relationships not only with suppliers, but also between suppliers.

As the client’s procurement team progress from one construction project to another, they develop a wealth of knowledge over time. This knowledge, however, largely remains tacit. Efforts should be undertaken to capture this knowledge, and then not only shared with practitioners and policymakers to inform future decision making, but also be imbued into university curriculums to give the leaders of tomorrow a flavour of the complexity of infrastructure projects, and the strategies to address them.

Procurements’ role in the business

One of the key priorities in putting together a world class organisation is determining how best to structure procurement’s various roles in corporate, business unit, and functional-level acquisition. Should the procurement function own, control, and manage the entire process for every corporate stakeholder? Should it participate actively in the procurement decisions and processes of the individual business units, functions, and sectors in which the company operates? Or should it merely carry out rudimentary purchasing decisions, predetermined by other parts of the organisation.





Every competent procurement function understands the importance of working with, influencing and managing its stakeholders. Yet too often, the basics of stakeholder management are not in place. The hypothesis is that if stakeholders don't understand how they are going to work with procurement, it is hard to see that they are going to be enthusiastic about more strategic activities; joint working groups, innovation initiatives, shared cost reduction programmes and so on. If stakeholders don't understand the rules and policies around procurement and if they don't know who they should talk to in procurement (which is where clarity of structure comes into it), there are likely to be problems. Once they understand these basics, then procurement team can show them that we can help them achieve their business goals, and ultimately act as partners and trusted advisers.

This suggests that as well as clear communication with stakeholders, and appropriate governance processes, clarity around organisational structures is key, whether the chosen model is centralised or in Integrated Project Teams (IPTs). The people working within the procurement structure must understand how they fit into it. But it is just as important that the stakeholders of procurement understand how they relate to the overall structure and the role procurement plays within it.

For products or services that are less business specific but still must be somewhat tailored, such as temporary labour, maintenance and repair, and operational needs, procurement may play a facilitating role on behalf of a wider variety of business units or functions. Also, it might establish the guidelines for evaluating and scoring requests for proposals, while the business unit determines the exact specifications for the products or services it needs. The procurement function must identify where and how to exert its influence and leverage its process and technical knowledge, managing where necessary, facilitating where desirable, and supporting where most helpful. Doing so will allow it to determine the structure best suited to its various roles and the processes, tools, and capabilities needed to ensure that it has the maximum impact on overall expenditure of the organisation.

In conclusion, procurement must design simple, clear processes for actively managing its relationships with business unit and functional end-users, as well as internal demand. This will, in turn, allow procurement to play a greater role in the improvement of end-users' decision making. To do this, procurement needs to be integrated both at the front end, aiding end-users in developing their sourcing strategies and processes and at the back end, in supplier management and productivity improvement.

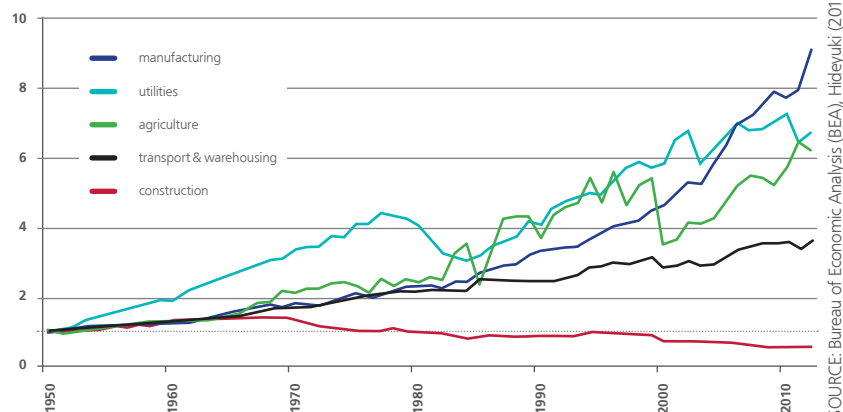
6. Continuous improvement

How we can learn from the successes in other sectors

In the construction sector, procurement can play a significant role in driving continuous improvement, quality, and innovation improving productivity throughout the supply chain. In the manufacturing industry, this is quite a well-known concept as the quality of the production process at the focal firm largely depends on the quality of inputs arriving from the suppliers. It is quite typical, for example, for Toyota's procurement managers to spend a significant part of their working time at the suppliers' plants training them on continuous improvement techniques, developing their capabilities, and addressing their issues. Therefore, procurement is seen as a strategic function in such industries, where productivity has doubled in recent times, whilst it has lagged in the construction sector.

Construction productivity 1950-2012

Real productivity (GDP value-add per employee) by industry in the US indexed – 1950 = 1.0



SOURCE: Bureau of Economic Analysis (BEA), Hideoyuki (2011)

Bringing together the Golden Triangle

As we move forward, there is a need to develop innovative business models, based on effective contracting strategies, sound business practices, and inter-organisational trust. In order to achieve this, three key participants will need to come together: the policymakers, businesses, and universities, to work toward a collective goal in the form of a "Golden Triangle". These three key participants lead very different domains. Yet to realise public value, they need to work in concert with each other.

They need to understand and share their current challenges and thinking with each other, design and implement research programmes, teaching and training curriculums, policy changes, and business strategies in alignment with each other. Therefore, efforts need to be made to bring these domains together to develop and achieve collective goals.

An example of this is the HPC Supply Chain Innovation Lab. This is a collaboration between University of Bath and Hinkley Point C, which aims to advance the science, policy, and practice of managing supply networks and complex projects. It provides a platform for thought leadership inside the Golden Triangle, connecting business leaders, policymakers, and academics to advance current practices and public understanding of large-scale projects. Fostering collaboration within the Golden Triangle is essential for the successful delivery of these projects, ultimately contributing to the welfare of the country and its people.

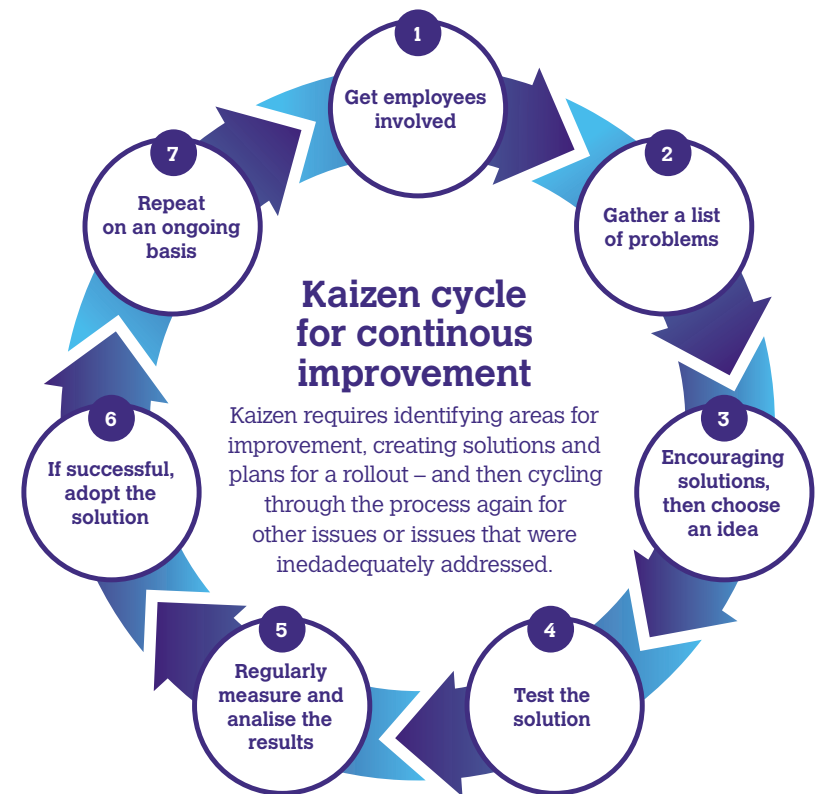


Dissemination of lessons learnt

Procurement professionals, as they move from one construction project to another, develop a wealth of knowledge over time. This knowledge, however, largely remains tacit. Efforts must be undertaken to codify this knowledge, and then not only shared with practitioners and policymakers to inform future decision making, but also be imbued into university curriculums to give the leaders of tomorrow a flavour of the complexity of infrastructure projects, and the strategies to address them.

Develop the leaders of tomorrow through training today

Procurement leaders of tomorrow, therefore, need to develop not just role professionals, but sector professionals as well. In other words, they should be able to overcome the bounds of their specialisms, understand the big picture of how a construction project comes together, to design and govern a network of suppliers which are capable of not only dealing with current challenges, but be agile in adapting and responding to evolving requirements of complex projects. Furthermore, procurement leaders of tomorrow should be able to move away from a risk-averse, safeguarding approach to supplier management, and embrace their role of coordinating the resources and capabilities of their network of suppliers.





7. Conclusions and recommendations

1. Simplify the transactional procurement process and focus more on strategic acquisition activities, in line with procurement best practice.
2. Design for productivity at the outset and maximise off-site construction in geographically diverse supply chain hubs.
3. Utilise Super ECI and build long term relationships with supply chain network to develop joint understanding of goals and form trust.
4. Be bold enough to try a different strategy rather than be constrained by “what we have always done.” Utilising new alliance contract models or Integrated Forms of Agreement.
5. Ensure “capable clients” incentivise staff in an aligned way so that different departments pull in the same direction and not opposite ones.
6. Involvement of procurement from the earliest stages of project inception is essential, develop key interface with BIM modelling.
7. Encourage supply chain partners to develop highly productive solutions with their supply chain and seek to share “developed” intellectual property is a positive way.
8. Use a balanced scorecard approach to tender evaluation criteria that include productivity as a significant part of the overall score.
9. Develop the capability of both client and supply chain network in the use of lean continuous improvement and support the delivery teams to drive improvement demonstrated by increased productivity.
10. Training our procurers of the future that productivity must take precedence over price is a massive priority that must be included in vocational and university degree curricula.

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